COORDINATING COMMISSION
FOR POSTSECONDARY EDUCATION

140 N. 8th Street, Suite 300
Lincoln, NE 68508

Telephone: (402) 471-2847
FAX: (402) 471-2886

PROPOSAL FOR NEW INSTRUCTIONAL PROGRAM

Form 92-40

SECTION I

Institution Submitting Proposal: University of Nebraska at Omaha

Title of Program: Computer Science Education Graduate Certificate

CIP Code: 11.0101

Organizational Unit in which program will be located:

Department of Computer Science, College of Information Science and Technology
Department of Teacher Education, College of Education

Name of contact person in the event additional information is needed: Dr. Susan M. Fritz

Telephone: 402-472-5242

Degree, Diploma, or Certificate to be offered (use separate submittal for each level):

Computer Science Education Graduate Certificate

Proposed date to initiate program: When approved by the Coordinating Commission

List the location(s) where this program will be offered: UNO

If the program has a projected ending date, please so indicate:

Date approved by Governing Board: September 16, 2016
(Attach all documents related to this proposal upon which the Governing Board made its decision to approve the proposal.)

Chief Executive Officer's or other Authorized Officer's signature: Susan M. Fritz

Susan M. Fritz

University of Nebraska Omaha

Graduate Certificate in Computer Science Education

[Pending approval of the M.S. in Computer Science Education]

Descriptive Information

- Name of institution proposing the program: The University of Nebraska at Omaha
- Name of the program proposing the certificate: M.S. in Computer Science Education (approval pending)
- Name of the proposed certificate program: Computer Science Education Graduate Certificate
- List the participating department(s): Department of Computer Science and the Department of Teacher Education
- CIP code: 11.0101
- Proposed delivery site(s), and type(s) of delivery, if applicable: On campus and distance education
- Proposed date (term/year) the program will be initiated: Upon approval
- List names of faculty members who will serve on the advisory committee:
  - Brian Dorn, Community Chair in Computer Science Education, Assistant Professor of Computer Science, and specialist in computer science curriculum development and education
  - Qiuming Zhu, Chair of the Department of Computer Science
  - Sarah Edwards, Chair of the Department of Teacher Education
- Are there adequate resources and a sufficient number of qualified faculty to support the certificate program? Yes

1. **How will the certificate program complement or enhance existing degree programs?**

   The courses comprising the certificate program are all existing courses within the M.S. in Computer Science Education (approval pending). Students completing the certificate may apply credits earned to the M.S. in Computer Science Education program.

2. **What is the student, community or market demand for this certificate?**

   A number of recent reports have raised attention about the lack of high quality opportunities for K-12 students to engage with computing, computer science and information technology early in their educational experiences (Donna George 2014). For example, the 2010 Running on Empty report (jointly prepared by the Association for Computing Machinery – ACM, and the Computer Science Teachers Association - CSTA) details the paradoxical increase in IT's importance in modern society along with a 17% decrease in access to pre-AP computing courses and a 35% decrease in access to AP CS courses at the secondary level nationwide since 2005 (Wilson et al., 2010).

In nearly every state, IT and CS courses do not fulfill state graduation requirements and no specific teacher certification is available or required (Lang et al., 2013). The lack of computer science instruction is significantly a national issue, as highlighted by the recent Washington Post article: High school students are all about computers but get little instruction in computer science (Donna George 2014), though nationwide curricular frameworks and standards exist (CSTA 2011), and teaching the material therein clearly requires specialized training in Computer Science content.

The lack of high quality elementary and secondary experiences in computing directly limits the number of students opting to pursue CS and other IT-related majors at the undergraduate level in University of Nebraska colleges. This is a significant pipeline problem and hinders Nebraska's nationwide competitiveness in the IT job sector, which is estimated to grow by 1.4 million jobs by 2020 according to the Bureau of Labor Statistics data. By 2020, one of every two STEM jobs will be in computing (Kaczmarczyk and Dopplick, 2014). Making a sustainable, systemic change requires a significant increase in the number of high-quality, well-trained IT teachers in U.S. schools. In response to this need, the National Science Foundation began the CS10K initiative (Astrachan et al., 2011) to train 10,000 new secondary-school computer science teachers to effectively teach a new curriculum that engages students in meaningful computational thinking (Wing, 2006) by 2015. While strides have been made towards increased teacher professional development nationwide, the U.S. is still a long way from achieving this ambitious goal (Cuny et al., 2014).

Nebraska has few specifically designated K-12 CS teachers, no required training in CS in order to teach computing courses (Wilson et al., 2010; Lang et al., 2013; Kaczmarczyk and Dopplick, 2014), no standardized high school CS curricula - and compared to other states, only relatively few students taking the AP CS exam. Most state-recognized IT courses are taught by teachers with only Business or Mathematics primary endorsements, resulting in courses (including AP Computer Science) being offered by instructors with at best one college level course in computer science. Thus many teachers are under-prepared to engage students meaningfully in IT coursework. One indicator of this can be seen in the AP exam statistics for Nebraska: Over 10,000 Nebraska high school students took AP exams in 2014, but only 71 students took the AP CS A exam (College Board, 2014).

At the same time, Nebraska is experiencing considerable growth in the information technology sector. A recent report from the Omaha Chamber of Commerce conservatively projects that there will be over 1,300 new IT job openings in the Omaha metro area in the next two years alone (Vaslow, 2013). Nebraska desperately needs to address the lack of systemic CS participation at the elementary, middle and secondary school levels to meet the demands of the local economy development and progress, and enable children to be competitive on the national and international job market.

3. **What are the procedures and stated qualifications for admission of students to the certificate program?**

   Students to be admitted should submit their application materials, which will include an application form, résumé, official transcripts, two recommendation letters, and a statement about his/her teaching philosophy. Applications will be accepted year around, with admissions take place for fall and spring semesters each year. Women, minority, and teachers with existing teaching experience in STEM areas will be encouraged to apply.

4. **What is the curriculum of the certificate program?**

   See the attached form on page 3

5. **What are the measures and procedures for verification of completion of the certificate requirements?**

   Students must maintain an overall GPA of 3.0 or above, complete all work associated with the courses, adhere to the attendance policies set by the department and/or instructors.

6. **What are the measures and procedures for ongoing evaluation of the certificate program?**

   This program will be included in the ongoing academic program review process for the Departments of Computer Science and Teacher Education. In addition, the graduation rate and graduates' employment opportunities will be measures of success.

Proposed Graduate Certificate Curriculum

Name of the existing master's program: M.S. in Computer Science Education (pending approval)

The assumption is that the certificate courses are a subset of an existing master's degree curriculum. Please attach a brief explanation if this is not the case.

Courses in the existing master's program (list course numbers)	**Master's program number of credit hours**	**Certificate program number of credit hours**
TED 8006	3	3
CSTE 8020 or CSTE 8030	3	3
CSTE 8040	3	3
CSCI/IASC 8366	3	3
CSCI 8836 or CSCI 8256	3	3
CSCI 8010 or other approved CSCI8xx0 course	3	3
Total:	**18**	**18**

REFERENCES

Astrachan, O., Cuny, J., Stephenson, C., & Wilson, C. (2011). The CS10K project: mobilizing the community to transform high school computing. In *Proceedings of the 42nd ACM technical symposium on Computer science education* (SIGCSE '11). ACM, New York, NY, USA, 85-86.

Cuny, J., Baster, D.A., Garcia, D.D., Gray, J., & Morelli, R. (2014). CS principles professional development: only 9,500 to go! In *Proceedings of the 45th ACM technical symposium on Computer science education* (SIGCSE '14). ACM, New York, NY, USA, 543-544. DOI=10.1145/2538862.2538876 http://doi.acm.org/10.1145/2538862.2538876

CSTA (2011). *CSTA K-12 Computer Science Standards.* ACM: New York, NY. (available online: https://csta.acm.org/Curriculum/sub/K12Standards.html)

The College Board (2014). Nebraska State Report on 2014 AP Exams (available online: http://media.collegeboard.com/digitalServices/pdf/research/2014/Nebraska_Summary.xlsx)

George, Donna (2014), *High school students are all about computers but get little instruction in computer science*, Washington Post, April 23, 2014 http://www.washingtonpost.com/local/education/high-school-students-are-all-about-computers-but-get-little-instruction-in-computer-science/2014/04/23/13979eda-c185-11e3-bcec-b71ee10e9bc3_story.html

Kaczmarczyk, L., & Dopplick, R. (2014). *Rebooting the Pathway to Success: Preparing Students for Computing Workforce Needs in the United States.* New York: ACM Press. http://pathways.acm.org

Lang, K., Galanos, R., Goode, J., Seehorn, D., & Trees, F. (2013). *Bugs in the System: Computer Science Teacher Certification in the US.* New York: ACM Press.

Wilson, C., Sudol, L. A., Stephenson, C., & Stehlik, M. (2010). *Running on empty: The failure to teach K-12 computer science in the digital age*, ACM and CSTA.

Vaslow, J. (2013). *Omaha Area IT and Engineering Study.* Available online: http://cdn.aimforbrilliance.org/pdf/2013omahaareaitandengineeringtalentstudy.pdf

Wing, J. M. (2006). Computational thinking. Communications of ACM, 49(3), 33-35.

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
Computer Science Education Graduate Certificate at UNO

	(FY 2016-17) Year 1	(FY2017-18) Year 2	(FY 2018-19) Year 3	(FY2019-20) Year 4	(FY 2020-21) Year 5	**Total**
Personnel						
Faculty						$0
Professional						$0
Graduate assistants						$0
Support staff						$0
Subtotal	$0	$0	$0	$0	$0	$0
Operating						
General Operating						$0
Equipment						$0
New or renovated space						$0
Library/Information Resources						$0
Other						
Subtotal	$0	$0	$0	$0	$0	$0
Total Expenses	$0	$0	$0	$0	$0	**$0**

There are no expenses associated with offering the graduate certificate in Computer Science Education. All courses are part of the M.S. in Computer Science Education.

TABLE 2: REVENUE SOURCES FOR PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
Computer Science Education Graduate Certificate at UNO

	(FY 2016-17) Year 1	(FY2017-18) Year 2	(FY 2018-19) Year 3	(FY2019-20) Year 4	(FY 2020-21) Year 5	Total
Existing Funds						$0
Required New Public Funds						$0
1. State Funds						$0
2. Local Tax Funds (community colleges)						$0
Tuition and Fees [1]	$19,764	$46,116	$79,056	$100,467	$115,290	$360,693
Other Funding						
1						
2						
3						
Total Revenue	$19,764	$46,116	$79,056	$100,467	$115,290	$360,693

1 The projection is that in Year 1 enrollment the graduate certificate will enroll 12 new students. As online course offerings increase, the enrollment is expected to increase until it reaches 25 students per cohort in Year 4. Students are expected to take around 6 credit hours a year. Tuition revenue is calculated based on resident tuition and distance education fees of $274.50 per credit hour in 2015-16.

Projected Student Credit Hours

	Year 1	Year 2	Year 3	Year 4	Year 5
Cohort 1: 12 students	6	6	6	Graduated	Graduated
Cohort 2: 16 students		6	6	6	Graduated
Cohort 3: 20 students			6	6	6
Cohort 4: 25 students				6	6
Cohort 5: 25 students					6
Projected Tuition	$19,764	$46,116	$79,056	$100,467	$115,290

University of Nebraska
EXECUTIVE VICE PRESIDENT AND PROVOST

Dear

September 19, 2016

Dr. Michael Baumgartner
Executive Director
Coordinating Commission for
Postsecondary Education
140 N. 8th Street, Suite 300
Lincoln, NE 68509

Dear Michael:

Enclosed is a copy of the proposal to create a Computer Science Education Graduate Certificate in the Department of Computer Science in the College of Information Science and Technology and in the Department of Teacher Education in the College of Education at UNO. The proposal was approved by the Board of Regents at the September 16, 2016 meeting. Also enclosed is the Proposal for New Instructional Program Form 92-40.

Please do not hesitate to contact me if you have any questions.

Sincerely,

Susan M. Fritz
Executive Vice President and Provost

Enclosures

c: Chancellor John Christensen
Senior Vice Chancellor B.J. Reed
Dean Hesham Ali, College of Information Science and Technology
Dean Nancy Edick, College of Education
Vice Provost David Jackson

Varner Hall / 3835 Holdrege Street / P. O. Box 830743 / Lincoln, NE 68583-0743
(402) 472-5242 / FAX: (402) 472-4240 / www.nebraska.edu

TO: The Board of Regents

Academic Affairs

MEETING DATE: September 16, 2016

SUBJECT: Creation of the Computer Science Education Graduate Certificate in the Department of Computer Science in the College of Information Science and Technology and in the Department of Teacher Education in the College of Education at the University of Nebraska at Omaha (UNO)

RECOMMENDED ACTION: Approval is requested to create the Computer Science Education Graduate Certificate in the Department of Computer Science in the College of Information Science and Technology and in the Department of Teacher Education in the College of Education at UNO

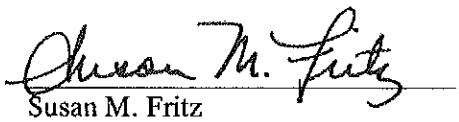
PREVIOUS ACTION: September 16, 2016 – The Board is considering approval of the Master of Science in Computer Science Education in the College of Information Science and Technology at UNO.

January 18, 2008 – Expedited approval of the UNO graduate certificate programs in Software Engineering, Communication Networks, Artificial Intelligence, and Systems and Architecture within the graduate program of Computer Science was reported to the Board.

EXPLANATION: The Department of Computer Science and the Department of Teacher Education at UNO propose to collaboratively implement a graduate certificate program in Computer Science Education. The proposed certificate, to be hosted by the College of Information Science and Technology with ongoing collaboration from the College of Education, is designed for students who are interested in teaching computer science at the K-12 level. The primary target students for this graduate certificate are in-service middle- and high-school STEM teachers in Nebraska, the eight-state Midwest region surrounding Nebraska, and nationwide – where there is a critical demand for the proposed program. The certificate program is designed for teachers not seeking a full MS (or second MS) degree.

The proposed certificate will require a total of 18 credits; students completing the certificate may apply credits earned toward the MS in Computer Science Education program.

Graduates of this program will be able to teach secondary-level computing courses and will be able to systematically integrate their knowledge of computing with their primary endorsement discipline (which could range from mathematics to science to even language or arts); this provides an opportunity for teachers to affect change in their local schools towards universal computational-thinking literacy, even if they are not teaching standalone computer science courses.

	The proposed certificate has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.
PROGRAM COST:	$0
SOURCE OF FUNDS:	No additional funds required above that necessary to implement the MS program
SPONSORS:	B.J. Reed Senior Vice Chancellor for Academic and Student Affairs John Christensen, Chancellor University of Nebraska at Omaha
RECOMMENDED:	 Susan M. Fritz Executive Vice President and Provost
DATE:	August 22, 2016